IN THE SPECIFICATION:

Please **AMEND** the specification as follows:

On pages 29-32, please amend the following paragraphs as follows:

"Figure 8 provides an example of some components of a CMTS that may be used to implement certain aspects of this invention. In the specific embodiment as shown in FIGURE 8, a CMTS 804 provides functions on three network layers including a physical layer 832, a Media Access Control (MAC) layer 830, and a network layer <u>833</u> ~~834~~. Generally, the physical layer is responsible for receiving and transmitting RF signals on the cable plant. Hardware portions of the physical layer include a downstream modulator and transmitter 806 and an upstream demodulator and receiver 814. The physical layer also includes software 886 for driving the hardware components of the physical layer.

Upstream optical data signals (packets) arriving via an optical fiber node 810 are converted to electrical signals by a receiver 812. Next, the upstream information packet (RF electrical signals) is demodulated by the demodulator/receiver 814 and then passed to MAC layer block 830. A primary purpose of MAC layer 830 is to encapsulate, with MAC headers, downstream packets and decapsulate, of MAC headers, upstream packets. In one embodiment, the encapsulation and decapsulation proceed as dictated by the above-mentioned DOCSIS standard for transmission of data or other information. The MAC headers include addresses to specific modems or to the CMTS (if sent upstream) by a MAC layer block 830 in CMTS 804. Note that the cable modems also include MAC addressing components. In the cable modems, these components encapsulate upstream data with a header containing the MAC address of the CMTS.

MAC layer block 830 includes a MAC hardware portion (e.g. MAC controller) 834 and a MAC software portion 884, which together serve the above-described functions. In a preferred embodiment, MAC hardware portion 834 is distinct from the router's general-purpose microprocessor and is dedicated to performing some MAC layer functions.
In specific CMTS configurations, the hardware portions of the physical layer 832 and MAC layer 830 reside on a physical line card 820 within the CMTS. The CMTS may include a plurality of distinct line cards which service particular cable modems in the network. Each line card may be configured to have its own unique hardware portions of the physical layer 832 and MAC layer 830.

After MAC layer block 830 has processed the upstream information, it is then passed to network layer block 833 ~~834~~. Network layer block 833 ~~834~~ includes switching software 882 for causing the upstream information packet to be switched to an appropriate data network interface on data network interface 802. When a packet is received at the data network interface 802 from an external source, the switching software within network layer ~~834~~ 832 passes the packet to MAC layer 830. MAC block 804 then transmits information via a one-way communication medium to downstream modulator and transmitter 806. Downstream modulator and transmitter 806 takes the data (or other information) in a packet structure and converts it to modulated downstream frames, such as MPEG or ATM frames, on the downstream carrier using, for example, QAM 64 modulation (other methods of modulation can be used such as CDMA (Code Division Multiple Access) OFDM (Orthogonal Frequency Division Multiplexing), FSK (FREQ Shift Keying)). The return data is likewise modulated using, for example, QAM 16 or QSPK. Data from other services (e.g. television) is added at a combiner 807. An optical converter 808 converts the modulated RF electrical signals to optical signals that can be received and transmitted via Fiber Node 810 to the cable modem hub.

Note that alternate embodiments of the CMTS (not shown) may not include network layer 833 ~~834~~. In such embodiments, a CMTS device may include only a physical layer and a MAC layer, which are responsible for modifying a packet according to the appropriate standard for transmission of information over a cable modem network. The network layer 833 ~~834~~ of these alternate embodiments of CMTS devices may be included, for example, as part of a conventional router for a packet-switched network. In a specific embodiment, the network layer of the CMTS is configured as a cable line card coupled to a standard router that includes the physical layer block 832 and MAC layer block 830. Using this type of configuration, the CMTS is able to send and/or receive IP packets to and from the data network interface 802 using switching software block 882.

The data network interface 802 is an interface component between external data sources and the cable system. The external data sources transmit data to the data network interface 802 via, for example, optical fiber, microwave link, satellite link, or through various media. The data network interface includes hardware and software for interfacing to various networks such as, for example, Ethernet, ATM, frame relay, etc.

As shown in FIGURE 8, CMTS 804 includes a central hardware block 850 including one or more processors 855 and memory 857. These hardware components interact with

software and other hardware portions of the various layers within the CMTS. They provide general purpose computing power for much of the software. Memory 857 may include, for example, I/O memory (e.g. buffers), program memory, shared memory, etc. The data structures described in this application may reside in such memory. Hardware block 850 may physically reside with the other CMTS components. In one embodiment, the software entities 882, 884, and 886 are implemented as part of a network operating system running on hardware 850. Preferably, at least a part of the timestamp synchronization functions of this invention are implemented in software as part of the operating system. In FIGURE 8, such software may be part of MAC layer software 884 and/or the switching software 882, or may be closely associated therewith. Of course, the timestamp synchronization logic could reside in hardware, software, or some combination of the two.

The procedures employed by the CMTS during registration and pre-registration are preferably performed at the MAC layer of the CMTS logic. Thus, in CMTS 804, most of the registration operations would be performed by the hardware and software provided for MAC layer logic 830.

The operations associated with obtaining an IP address for cable modems are preferably implemented at the network layer level 833 ~~834~~. As noted, this may involve the CMTS communicating with a DHCP server via data network interface 802, for example."

On pages 8-13, please amend the specification as follows:

"FIGURE 2 shows a block diagram of a conventional configuration for a cable network 200. As shown in FIGURE 2, the CMTS 210 may include a plurality of physically distinct line cards, e.g. line card A 202 and line card B 204. Each line card provides a separate interface for communicating with a specific group of cable modems in the network. For example, line card A 202 includes a distinct group of ports (e.g., 205, 212) for communicating with cable modem Group A 260a, and line card B includes a separate distinct group of ports (e.g., 225, 222) for communicating with cable modem Group B 260b.

Each line card within CMTS 210 includes a separate MAC controller for controlling the group of ports which reside on that physical line card. For example, on line card A, MAC controller 206 controls downstream transmitter 212 and the plurality of upstream receivers 205. Similarly, the MAC controller 208 on line card B controls downstream transmitter 222 and the plurality of upstream receivers 225.

As described briefly in the background of this application, each MAC controller includes its own unique timestamp counter for generating a local time reference specific to the particular line card on which it resides. Thus, for example, MAC controller 206 includes a first timestamp counter (not shown) which generates a local time reference to be used by line card A for communicating with the plurality of Group A cable modems. Likewise, MAC controller 208 includes its own timestamp counter (not shown) for generating a local time reference to be used by line card B for communicating with the Group B cable modems. In conventional CMTS systems, the timestamp counters which reside on different line cards are not synchronized.

Because data-over-cable service is a relatively new and emerging technology, conventional cable networks have been designed to be efficient in handling burst data transmissions from the plurality of network cable modems to the CMTS. Additionally, conventional cable network configurations are designed to take into account the asymmetrical bandwidth allocation on the upstream and downstream channels. For example, a downstream channel will typically have a bandwidth of 30-50Mbps, and an upstream channel will typically have a bandwidth of 1-10Mbps. In taking the above factors into account, it is common practice to statically configure each line card to include a single downstream channel transmitter and a pre-determined number of upstream channel receivers (up to a maximum of 6 upstream receivers).

Due to the static configuration of conventional cable networks such as that shown in FIGURE 2, it is common practice to assign the downstream and upstream channels of each physical line card within the CMTS to a unique DOCSIS domain. By assigning each line card (and its associated downstream and upstream channels) to a unique DOCSIS domain, one is able to take full advantage of the limited addressing space available within each DOCSIS domain. In the example of FIGURE 2, line card A is associated with domain A which includes one downstream A channel 213 and six upstream A channels 219. The cable modems which use the domain A downstream and upstream channels to communicate with the CMTS (e.g., Group A cable modems 260a) are considered to be part of domain A and share a common address map specific to domain A. <u>The downstream signals are carried to optical node A 252a.</u> Similarly, line card B is associated with domain B, which includes a single downstream B channel 223, and a plurality of upstream B channels 229. <u>The downstream signals are carried to optical node B 252b.</u> The cable modems of Group B (260b) which use the domain B upstream and downstream channels to communicate with the

CMTS are considered to be part of domain B, and share a common address map specific to domain B.

Because conventional line cards are configured to include at most six upstream receivers, it is not possible for a cable operator (or other service provider) to configure a cable network to have a DOCSIS domain which includes, for example, one downstream channel and eight upstream channels. Even if two extra upstream channels were available on a separate line card, it would not be possible to include these two extra channels in the DOCSIS domain associated with the first line card. This limitation is depicted by way of example with reference to FIGURE 2B of the drawings.

FIGURE 2B shows a block diagram of an alternate embodiment of a conventional implementation of a cable network. A primary difference between the cable network of FIGURE 2B and that of FIGURE 2 is that, in FIGURE 2B, upstream receiver ports B1 and B2 of line card B are connected to the Group A cable modems 260a. In the example of FIGURE 2B, it is assumed that the cable operator desires to configure two separate DOCSIS domains such that the first DOCSIS domain (domain A) includes a single downstream channel and eight upstream channels, and the second DOCSIS domain (domain B) includes a single downstream channel and four upstream channels.

One technique for implementing the above-described DOCSIS domains is illustrated by the configuration of FIGURE 2B. As shown in Fig. 2B, two upstream receivers B1 and B2 from line card B are assigned to domain A and physically connected to the cable modems of Group A. Thus, in the embodiment of FIGURE 2B, domain A includes one downstream channel A 213 and 8 upstream channels 219a, 219b. Domain B includes downstream channel B 223, and four upstream channels 229.

Unfortunately, conventional cable networks are not configured to support the configuration illustrated in FIGURE 2B. More specifically, in conventional cable networks, it is not possible for a cable modem to "listen" to the CMTS on a downstream channel associated with a first line card, and "talk" to the CMTS on an upstream channel associated with a different line card. Thus, as shown in FIGURE 2B, the cable modems of domain A (e.g. Group A 260a) are not able to "listen" to the CMTS on downstream channel A (213) and "talk" to the CMTS using upstream channels 219b (associated with receivers B1 and B2). This is because line card A uses a different time reference than that of line card B. More specifically, the time reference for downstream channel A is generated by a local timestamp counter within MAC controller 206, and the time reference for downstream channel B is

generated by a different timestamp counter within MAC controller 208. Moreover, the timestamp counters of MAC controllers 206 and 208 are not synchronized, meaning that the time reference for line card A is different than the time reference for line card B.

In order to understand why the configuration of Figure 2B would not work in conventional cable networks, it is helpful to review the protocol by which a cable modem communicates with the CMTS. Using cable modem CM1 (261) as an example, in order for CM1 to transmit data to the CMTS, it first sends a data grant request to the CMTS on a predetermined upstream channel (e.g., channel A1). When the MAC controller 206 receives this request, it schedules a future time slot on the A1 channel for the CM1 modem to transmit its data. This time slot is conventionally referred to as a data grant slot. The MAC controller 206 is responsible for scheduling data grants for all upstream channels within its domain (e.g., domain A). The data grants for each upstream channel are compiled by the MAC controller and incorporated into MAP messages to be broadcast to cable modems using that particular upstream channel. The channel MAP message will include instructions to each cable modem requesting a data grant to transmit its data at a specific time. As described previously, "time" in this context is tracked using a local time stamp counter which is part of the MAC1 controller 206. In order to assure that each of the cable modems using a particular domain A upstream channel are synchronized with the MAC1 controller, the MAC1 controller periodically broadcasts a current timestamp message (or timestamp value) to each of the domain A cable modems via the downstream A channel 213. The domain A cable modems then use this timestamp message to synchronize their internal timestamp counter with the timestamp counter of the MAC1 controller.

In the configuration of Figure 2B, if cable modem CM1 is configured, for example, to "listen" to the CMTS on downstream channel A (213) and configured to "talk" to the CMTS on upstream channel B1 (which is part of domain A), it follows that CM1 will receive timestamp messages (via downstream channel A) which correspond to the timestamp counter of line card A. However, the cable modem CM1 is configured to "talk" with the CMTS via upstream channel B1 which resides on line card B. Thus, in order for CM1 to transmit data on upstream channel B1, it must first receive a data grant timeslot. Conventionally, the data grant time slot is specified in a MAP message for upstream channel B1. Since the upstream channel B1 receiver physically resides on line card B, the timeslot allocated for CM1 to transmit its data will be expressed in terms of the local time reference of line card B. Thus, cable modem CM1 would need to be synchronized with line card B in order to properly

transmit its data to the CMTS via upstream port B1. Since CM1 and the other modems of domain A (Group A) are synchronized with line card A, none of the domain A modems would be able to transmit data to the CMTS via upstream channels B1 or B2 (219b). For this reason, using conventional techniques, it is undesirable to group together, within a single domain, different upstream ports that reside on different line cards within the CMTS. However, using the technique of the present invention, it is possible to configure a single domain which includes a plurality of upstream channels in which a first portion of the upstream channels is associated with ports residing on a first line card, and a second portion of upstream channels is associated with ports residing on a second line card.

The technique of the present invention involves utilizing a master time reference device which maintains and updates a current time reference, and periodically distributes synchronization signals to desired line cards in the system in order to synchronize these line cards. In a specific embodiment, the synchronization signals include current timestamp data generated from the master time reference device and distributed to all (or selected) line cards in the system. A slave time reference device on each of the line cards receives the periodic synchronization updates and uses the synchronization data to remain synchronized with the master time reference device. There are also provisions in this protocol to allow for hot insertion and removal of line cards, software reset or loading of the master and/or slave time reference devices, and redundant master time reference devices, including master time reference device fault detection and automatic fail over.

FIGURE 3 shows a block diagram of a specific implementation of a cable network 300 in accordance with a specific embodiment of the present invention. As shown in FIGURE 3, a synchronization circuit 350 is included at the head end of the cable network. The synchronization circuit 350 includes a master time reference device, which, in a specific embodiment, is a timestamp counter referred to as the system timestamp master. As explained in greater detail below, the synchronization circuitry 350 may include hardware and/or software which is used to synchronize selected line cards within the CMTS. In a specific embodiment, the synchronization circuitry resides within CMTS 310. However, in an alternate embodiment (not shown), the synchronization circuitry may reside outside the CMTS.

Referring to FIGURE 3, a master time reference device (not shown) located within synchronization circuit 350 maintains and updates current time reference data, and periodically distributes synchronization signals to each (or a selected portion) of the MAC

controllers (e.g., 306, 308) within the CMTS in order to synchronize the time reference devices located in each of the MAC controllers. The synchronization information includes current time reference data generated by the master time reference device. In a specific embodiment, the current time reference data is a timestamp value generated from the master timestamp counter. Each MAC controller receiving the synchronization data is configured to use the current time reference value to synchronize its internal time reference device (e.g., timestamp counter) with the master time reference device. The time reference devices which reside in the MAC controllers may be referred to as slave time reference devices (or slave timestamp counters). By synchronizing each of the slave time reference devices with a master time reference device, each MAC controller within the CMTS may be synchronized with the other MAC controllers within the CMTS, thereby resulting in each of the line cards within the CMTS being in synchronization.

Using the technique of the present invention, it is possible to configure a single DOCSIS domain to include a plurality of upstream and/or downstream ports from physically different line cards, as shown, for example in FIGURE 3. For example, as shown in FIGURE 3, two upstream channel receivers A7 and A8 (322) from line card B have been assigned to domain A and grouped together with the ports 305 and 312 of line card A. As described in greater detail below, any cable modem of domain A (i.e. Group A 360a) may be configured to "listen" to the CMTS via a downstream channel on line card A (e.g., downstream channel A, 313), and to "talk" to the CMTS via any one of the plurality of domain A upstream channel receivers A1-A6, A7, A8.

For purposes of illustration, the example described above with respect to FIGURE 2B will now be applied to the network configuration of FIGURE 3. In this example it is assumed, that cable modem CM1 361 is configured to receive information from the CMTS via downstream channel A 313, and configured to transmit data to the CMTS via upstream channel A7 (of 319b). Since cable modem CM1 is configured to receive information from the CMTS via downstream channel A, it follows that the CM1 modem will synchronize itself with the line card A time reference by utilizing the timestamp messages generated by the MAC1 controller 306 and broadcast to the Group A cable modems via downstream channel A 313. In accordance with the technique of the present invention, however, the MAC1 timestamp counter (of line card A) is in synchronization with the MAC2 timestamp counter (of line card B). Accordingly, it follows that, by synchronizing itself with the MAC1 timestamp counter, cable modem CM1 is also in synchronization with the MAC2 timestamp

counter.

When the CM1 modem wishes to transmit data to the CMTS, it sends a data grant request to the CMTS via upstream channel A7. In a specific embodiment packets sent by any of the cable modems to the CMTS are received at a central location, regardless of the particular upstream channel used. The CMTS includes software and/or hardware for receiving the packets, interpreting the packets, and forwarding the packets. Additionally, in the example of FIGURE 3, the Head End will include additional hardware and/or software for managing one or more DOCSIS domains across a plurality of line cards. This additional hardware and/or software allows the CMTS to know specifically how each of the different domains are mapped and grouped. For example, referring to FIGURE 3, the CMTS will know that downstream channel A 313 is to be used for communicating with cable modems using upstream channels A7 or A8 (319b), and that downstream channel B 323 is to be used for communicating with cable modems using upstream channels B1-B4 (329). In a specific embodiment, the additional hardware and/or software resides within the CMTS. Alternatively, the additional hardware and/or software may reside outside the CMTS.

Further, according to a specific embodiment, the logic for generating channel MAP messages resides at some central location within the CMTS, and does not reside on the individual line cards. In an alternate embodiment, each line card will include additional hardware and/or software for generating channel MAP messages for the upstream channels associated with that particular line card. In this latter embodiment, additional hardware and/or software may also be included for allowing channel MAP messages generated from a first line card to be broadcast on the downstream channel(s) of a different line card. Thus, for example, as shown in FIGURE 3, when a data grant request is received from cable modem CM1 on upstream channel A7, a device within the CMTS responds to this request by scheduling a data grant for the CM1 modem in the next channel A7 MAP message. In one embodiment, the channel A7 MAP message is generated by the MAC2 controller 308. In an alternate embodiment, the channel A7 MAP message is generated by the MAC1 controller 306. Alternatively, the channel A7 MAP message may be generated by another device (not shown) within the CMTS. After the channel A7 MAP message has been generated (which includes a data grant for cable modem CM1), appropriate hardware and/or software within the CMTS forwards this MAP message to line card A so that the MAP message may be broadcast to the cable modems of Group A that utilize upstream channel A7. When the cable modem CM1 receives the channel A7 MAP message, it will be instructed to transmit its data

(on upstream channel A7) at time T1. In this example, it is assumed that the time T1 is based upon the local time reference associated with line card B. Even though cable modem CM1 is synchronized with line card A, it may still use its internal timing device to transmit its data at time T1 since line card A is synchronized with line card B.

In order to illustrate how the technique of the present invention may be used to overcome some of the limitations associated with conventional cable network configurations, an example of a video-on-demand application will now be described using the network shown in FIGURE 3B. The embodiment of FIGURE 3B is similar to that of FIGURE 3, however, in FIGURE 3B, downstream channel A (313) and downstream channel B (323b) are RF combined and connected to a single optical fiber which carries the downstream signals to both optical node A 352a and optical node B 352b. Thus, each of the cable modems within Group A (360a) and Group B (360b) are able to receive both downstream channel A and downstream channel B.

In this example using FIGURE 3B, it is assumed that each downstream channel (313, 323b) is provided sufficient bandwidth for simultaneously broadcasting a plurality of different movies or other video data. Further, it is assumed that a user connected to cable modem CM1 (361) has previously been watching a movie on downstream channel A, and communicates with the CMTS via upstream channel A1. In this example, the user at CM1 now wishes to watch a movie which will be broadcast on downstream channel B. At this point, the CMTS has a number of different options by which to proceed. First, the CMTS may provide the desired movie to CM1 on downstream channel A. However, even assuming that the cable operator has the additional bandwidth to provide this movie on downstream channel A, this option is undesirable as it is considered to be a waste of resources to broadcast the identical movie on two different downstream channels. Alternatively, a preferred solution would be for the CMTS to instruct the cable modem CM1 to switch downstream channels and receive the movie on downstream channel B.

In conventional cable networks, this option would not available to the CMTS since, without synchronization between the two line cards A and B, it would not be possible for the cable modem CM1 to "listen" to the CMTS on downstream channel B and "talk" to the CMTS on upstream channel A1. However, using the synchronization technique of the present invention, the CM1 cable modem is able to obtain current timestamp data from downstream channel B (associated with line card B), and use this current timestamp data to synchronize itself with line card A in order to "talk" to the CMTS via upstream channel A1.

Thus, referring to FIGURE 3B, the synchronization circuitry 350 causes each of the timestamp counters within each respective MAC controller (306,308) to be in synchronization. Accordingly, cable modem CM1 (361) is able to use the timestamp message on downstream channel B (323b) to communicate with the upstream receivers 305 on line card A. Thus, referring to the video-on-demand example (described above), when the cable modem CM1 sends a request to the CMTS to view a movie which is currently being broadcast on downstream channel B, the CMTS may respond by instructing the cable modem to switch its downstream channel from downstream A to downstream B. The cable modem CM1 is then able to "listen" to the CMTS on downstream channel B, and "talk" to the CMTS using any one of the upstream A channels 319a, 319b. In a specific embodiment, the CMTS includes software to enable the different line cards within the CMTS to speak to each other. In the video-on-demand example, this software would instruct the CMTS to tell the modem CM1 to switch its downstream channel to downstream B in order to receive the desired movie.

In accordance with the several embodiments of the present invention described in this application, the technique of the present invention may be used to synchronize a plurality of different access controllers which control a plurality of distinct ports at the Head End of an access network. In the context of a cable network, the technique of the present invention may be used to synchronize desired upstream and/or downstream channels across different line cards within a Cable Modem Termination System (CMTS). Moreover, the technique of the present invention offers a number of distinct advantages over conventional techniques used in the configuration or design of access networks.

For example, the technique of the present invention is particularly useful or advantageous in access networks implementing redundancy protocols. Referring to FIGURE 3B, for example, a modification may be made whereby the upstream and downstream ports on each line card are connected to both optical node A 352a and optical node B 352b. In this modified embodiment, each of the cable modems in the network has access to the ports on both line card A and line card B. Initially, it may be assumed that line card A services the cable modems of Group A 360a, and line card B services the cable modems of Group B 360b. In accordance with the technique of the present invention, if a problem occurs on line card A, for example, the Group A modems are able to switch over to the line card B without these modems having to resynchronize themselves with the line card B time reference (since line card A is already synchronized with line card B). In conventional systems, however, the two

line cards would not be synchronized. Thus, any modems switching from line card A to line card B are required to re-synchronize with line card B. This, in turn, introduces delays in the communication protocol between the cable modem and the CMTS. In certain applications, such as telephony, such delays are extremely undesirable since they directly effect the call quality of a voice call, for example.

In addition to providing benefits for redundancy protocols, the timestamp synchronization technique of the present invention provides for seamless downstream channel change at the cable modem end. This feature is described in greater detail in the provisional application referenced at the beginning of this application. Timestamp synchronization also provides benefits in facilitating multi-service convergence of voice, video, and high-speed data applications. These issues become increasingly important as streaming media and video streams are multiplexed onto the same data network.

Additionally, the technique of the present invention provides added flexibility in network implementation by allowing DOCSIS (or MAC) domains to be dynamically configurable via software. Further, each DOCSIS domain may be configured to cross line card boundaries. Thus, the technique of the present invention provides the advantage of allowing different upstream and/or downstream ports on different line cards to be grouped together within the same DOCSIS domain. This, in turn, provides the advantage of allowing greater flexibility in the design of line card interfaces. Furthermore, since different ports on different line card interfaces may be assigned to the same domain, the cable operator or service provider is allowed greater flexibility and scalability in configuring different domains to suit the needs specific applications such as, for example, telephony, video-on-demand, etc. Several of these advantages are illustrated by way of example in the description of FIGURE 4.

FIGURE 4 shows a block diagram of a specific embodiment of a Cable Modem Termination System (CMTS) 400 which may be implemented using the technique of the present invention. As shown in FIGURE 4, separate upstream and downstream line cards may be provided within the CMTS, which offers greater flexibility and scalability to the cable operator or service provide when configuring particular domains in the network to be optimized for specific applications. Thus, as shown in FIGURE 4, a first line card 404 includes a plurality of downstream channels 407 corresponding to ~~or~~ downstream transmitters 405, and a second line card 412 includes a plurality of upstream channels 409 corresponding to upstream receivers 445. By synchronizing each of the line cards in accordance with the

technique of the present invention, it is then possible to dynamically assign (via software) a first group of upstream and downstream channels to a first domain, a second group of upstream and downstream channels to a second domain, and so on. In this way, the service provider is provided with tremendous flexibility in being able to group any combination of upstreams and/or downstreams together within a single domain. As long as the MAP messages, timestamp synchronization messages, and upstream channel descriptors are distributed appropriately, any number of DOCSIS domains may be implemented, wherein each domain includes any desired combination of upstream and downstream channels available at the CMTS. This provides the cable operator or service provider tremendous flexibility when configuring a cable network or other access network to suit specific applications. For example, video-on-demand applications are downstream bandwidth intensive, and therefore the service provided may wish to configure a domain for this application which includes a large number of downstream channels and a relatively few number of upstream channels. However, for voice applications, the service provider may wish to configure the network differently. Since voice applications, such as telephony, for example, use approximately symmetrical bandwidth, it may be preferable to configure a CMTS (or one or more line cards within the CMTS) to include an appropriate ratio of upstream and downstream channels within each domain in order to provide each domain with symmetrical bandwidth."

On page 23, please amend the following paragraph:

"In the specific embodiment of Figure 6, it is assumed that each of the synchronization signals generated by the timestamp master device are received at each of the timestamp slave devices at exactly the same time, as represented by CLK signal 602. At A, the TSM_RST signal 604 is asserted to thereby cause each of the timestamp slave devices to reset its respective holding register 534 and timestamp counter 532. In a specific embodiment, software may be used to control the TSM_RST signal via a PCI mapped register, for example. In general, the TSM_RST signal may be asserted at any time except for when a load sequence is in progress (e.g., TSM_DATA_VALID signal is asserted)."